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CONTROL OF PLANT LICE IN THE VEGETABLE GARDEN

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Aphids, or plant lice, are small, soft-bodied insects that obtain their food by sucking the juices from plants by means of a beak which they insert most often in the underside of a leaf. They often cause the leaf to curl, and in the case of severe attacks ruin the crop by killing many of the plants.

Altho there are many species of aphids which attack vegetable crops, fortunately they can all be controlled by the same materials and the same methods. Some species of garden aphids have certain peculiar habits, a knowledge of which enables one to deal with them effectively.

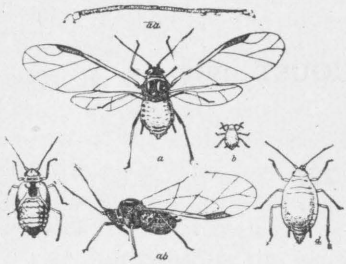
GENERAL CONSIDERATIONS

Life History.—The life history of all the garden plant lice is much the same. All pass the winter in the egg stage in northern localities, tho some adults may survive the winter in the southern part of this state. Most of the females produce living young without the intervention of the male. Both sexes appear in the fall, however, and fertilization occurs previous to the laying of the eggs, which survive the winter. All species produce both winged and wingless forms. They reproduce very rapidly. Each female probably produces on the average more than forty young, and as many as fifteen to twenty-five generations per year may be found in this region.

Color.—Most of the different species have characteristically colored bodies, but the color of the aphids of some species may vary

from a pale green to nearly black. Most aphids are some shade of green, but they may be black, pink, yellow, or almost white.

Habits.—While most aphids of the same species feed upon only closely related plants, it sometimes happens that they will feed upon plants distantly related. This is an important fact which should be considered in the control measures. For instance, the potato louse (*Macrosiphum solanifolii*) spends the winter, early spring, and late fall on the rose in preference to other plants. It migrates to potatoes, tomatoes, peppers, eggplants, and many other plants, during the latter part of spring. The pea aphid (*Macrosiphum pisi*) migrates back and forth between peas and clover. The spinach aphid (*Myzus persicæ*) feeds upon a wide range of vegetables and trees, including peach, cherry, spinach, cabbage, celery, etc. The cabbage louse (*Aphis brassicæ*) is mostly confined to plants of the family cruciferæ, and the melon louse (*Aphis gossypii*) is usually confined to vine crops.



MELON APHIS
(Courtesy S. A. Forbes, State Entomologist)

CONTROL

Clean Culture.—The first step in the control of plant lice is to destroy everything upon which the winter eggs of the aphid are laid. Crops badly infested with aphids in the fall should be disked and plowed under or burned. Weeds, especially those belonging to the same families as the cultivated crops, should not be allowed to grow, as they afford an excellent breeding place.

Spraying.—Many instances have been reported this summer of the failure of arsenical sprays to control plant lice. That is to be expected, for it must be remembered that aphids insert their beaks into the plant tissues for their food and are not injured in the least by arsenical sprays. Some spray must be used which will kill the insect by contact and yet be so weak that it will not injure the plant.

Nicotine Preparations.—Nicotine sulfate (40 percent nicotine) is the most easily prepared and most effective spray that can be used against aphids. One of the popular brands is known as "Black Leaf 40." When used at the rate of one part nicotine sulfate to one thousand parts of water the spray is effective against most aphids. The following formula supplies the ingredients in the right proportions:

Nicotine sulfate (40 percent nicotine)...⅜ pint, or 6.1 fluid ounces
Any laundry soap..... 3 pounds
Water .....50 gallons

The soap is added as a spreader and to make the solution slightly more volatile. When the nicotine sulfate is used with water alone, the addition of soap aids materially, but when used in combination with other sprays, the soap is omitted. The nicotine sulfate may be added to Bordeaux mixture, lime sulfur, or arsenate of lead in the same proportions as with water. The one application may thus serve two or more purposes.

When used against the potato aphid, the strength of the above formula should be increased to one part to eight hundred: that would be ½ pint of nicotine sulfate to 50 gallons of water.

For small patches 1½ teaspoonfuls of nicotine sulfate and 1 ounce of soap to each gallon of water will prove effective against all garden aphids.

To prepare the solution, all that is necessary is to measure out the amount of nicotine sulfate needed, put it in the spray outfit and dilute with water, Bordeaux mixture, or lime sulfur to the proper proportion. When soap is added, it is best to dissolve it in hot water.

Tobacco Decoction.—When tobacco stems or dust can be secured cheaply, they may be made into an economical and effective spray by heating to near the boiling point 2 pounds of stems, or dust, in 4 gallons of water and steeping for one hour. The water should then be drained off and used immediately. Care should be taken to prevent the solution from boiling, or from being made alkaline by the addition of lime or soap, as both processes will drive off the nicotine and make the spray worthless.

Kerosene Emulsion.—Kerosene emulsion is not recommended for the control of plant lice as it is likely to burn the foliage, but in case tobacco preparations are not on hand and cannot be secured, a fair degree of success may be obtained by its use. The stock solution is prepared by boiling ½ pound of soap in 1 gallon of water. When the soap is dissolved, the solution is removed from the fire and poured into 2 gallons of kerosene. The mixture is then thoroly agitated for five to ten minutes, and should finally have the consistency of cream. A force pump with the nozzle turned back into the liquid is very useful in mixing the solution. It should be diluted with ten to twenty parts of water for use against plant lice.

Method of Application.—All sprays used for aphids must come into direct contact with the lice or they will not be effective. As the aphids are found on the lower sides of the leaves, it is necessary to have a spraying apparatus which will underspray the leaves. A nozzle attached to the pole at an angle of 45 degrees serves this purpose very well. To do effective work it is necessary that a man with a spray pole direct the spray where it is needed, as but few row-sprayers do the work thoroly.

It is highly desirable that high pressure (125 to 175 pounds) be used, as this creates a mist which is blown about and reaches many more lice than would otherwise be possible.

For a few plants an atomizer or whisk broom may be used for applying the spray. For city gardeners a knapsack spray is usually sufficient. However, for really effective work a barrel pump or power outfit is best, because it furnishes more pressure. The barrel pump is large enough for the average commercial garden, while the power outfit may be used on large commercial gardens. One to four leads of hose may be used on a power outfit.

The spraying should be done while the foliage is dry, as moisture on the plants tends to weaken the spray material and make the results unsatisfactory. The training of the vine crops into rows makes the application of the spray much easier.

CONTROL IN GREENHOUSES

For the control of aphids in greenhouses, the evaporation of a quickly volatile alkaline preparation known as "Nico-Fume" is recommended. It may be evaporated most conveniently on steam pipes or over oil lamps, and is used at the rate of 1 ounce to each 4,000 cubic feet of greenhouse space. The fumigating should be done on a still night, with all the ventilators tightly closed. An oil can with the opening enlarged is excellent for applying the "Nico-Fume" to the steam pipes.

PROTECTING THE NATURAL ENEMIES OF APHIDS

Aphids are preyed upon by many insects and internal parasites. Gardeners should become familiar with these friends and protect rather than kill them. Among the most important of these predaceous insects are: the larvæ of the syrphus flies (sweat flies) and lace-wing flies, the larvæ and adults of the lady-bird beetles, and most important of all, the internal parasites which live within the bodies of the aphids and emerge as minute fly-like insects.

CONCLUSIONS

The control of plant lice is really very easy even tho the lice may attack every vegetable in the garden. The most important points to be remembered in controlling lice are: First, to watch constantly and apply the remedy as soon as the pest appears and before it has curled the leaves; second, to make a thoro application of the spray; and third, to use as high pressure as is convenient.